

## Andrew Wolfe Ph.D.

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### Education:

Ph.D. in Computer Engineering, Carnegie Mellon University, 1992  
Visiting Graduate Student, Center for Reliable Computing, Stanford University, 1988-1989  
M.S. in Electrical and Computer Engineering, Carnegie Mellon University, 1987  
B.S.E.E. in Electrical Engineering and Computer Science, The Johns Hopkins University, 1985

### Recent Employment:

Consultant, [October 2002-present]

#### **Wolfe Consulting**

Consultant on processor technology, computer systems, consumer electronics, software, design tools, and intellectual property issues. Testifying and consulting expert for IP and other technology-related litigation matters.

Sample clients include:

AMD	Nvidia	Samsung
IBM	Motorola	HTC
SMIC	AMKOR	Huawei
Dell	Honeywell	Western Digital
Nintendo	Kingston	Sonos
Moneygram	Arraycomm	Insilica
Synaptics	Activision	Sawstop
Mysticom	P.A.R.C.	Quester Ventures

Lecturer, [September 2013-present]

#### **Santa Clara University**

Teaching graduate and undergraduate courses on computer architecture, electronics and embedded computing, and mechatronics.

Chief Technical Officer, [1999-2002]; Sr. VP of Business Development, [2001-2002]; VP, Systems Integration, S3 Fellow, [1998 – 1999]; Director of Technology, S3 Fellow, [1997 - 1998]

**SONIC|blue, Inc.**, Santa Clara, CA (formerly S3 Inc.)

#### **Strategic Business Development:**

Developed and implemented strategy to reposition S3 from PC graphics into the leading networked consumer electronics company.

- Acquired Diamond Multimedia and coordinated integration of communications, Rio digital music, and workstation graphics divisions into S3.
- Identified and negotiated acquisitions to grow digital media businesses including Empeg, ReplayTV, and Sensory Science.
- Identified and negotiated strategic investments including Comsilica, Intellon, KBGear Interactive, Entridia, DataPlay and others.
- Developed strategy for integrated graphics/core-logic products and established a joint venture with Via Technologies to design and market these products.
- Negotiated divestiture of graphics chip business to Via and the workstation graphics division to ATI.

**Product Planning and Development:**

- Drove roadmap development within SONICblue product divisions.
- Managed Business Development for all product lines.
- Led New Product Development and Corporate Vision processes.
- Acting co-General Manager of Rio digital music business in 2<sup>nd</sup> half of 2001. Responsible for all areas of product development, business development, and cost management.
- Managed development of the Savage/MX and Savage/IX mobile 3D graphics accelerators and Savage/NB system logic products.

**Public Relations, Public Policy and Investor Relations:**

- Present company products and strategy at industry events such as CES, Comdex, and Microprocessor Forum.
- Discuss new products and initiatives with the press.
- Promote issues of interest to SONICblue to industry groups and in Washington.
- Brief analysts, and investors on company progress. Participate in quarterly conference calls.

**IP Management and Licensing:**

- Negotiated and managed partnership agreements including a critical cross-licensing agreement with Intel.
- Renegotiated technology-licensing agreements with IBM for workstation graphics products.
- Evaluated outside technology opportunities, managed video research and development, and managed corporate IP strategy with legal staff including patent filings, cross licensing, and litigation.

Consulting Professor, [1999-2002]

**Stanford University**, Stanford, CA

Teaching computer architecture and microprocessor design.

Assistant Professor [1991 - 1997]

**Princeton University**, Princeton, NJ

Teaching and research in the Electrical Engineering department. Research in embedded computing systems, multimedia, video signal processors, compiler optimization, and high performance computer architecture. Principal investigator or project manager for ~\$6M in funded research.

Visiting Assistant Professor, [1992]

**Carnegie Mellon University**, Pittsburgh, PA

Research and preparation of teaching materials on advanced microprocessor designs including new superscalar and superpipelined processor architectures.

Founder and Vice President and Consultant, [1989 - 1995]

**The Graphics Technology Company, Inc.**, Austin, TX

Founded company to develop touch-sensitive components and systems for the first generation of PDA devices and interactive public systems. Obtained financing from Gunze Corp., Osaka, Japan. Company is now part of 3M.

Senior Electrical Engineer, [1989]

**ESL - TRW, Advanced Technology Division**, Sunnyvale, CA

Designed the architecture for an Intel i860-based multiple-processor digital signal processing system for advanced military applications. Designed several FPGA interface chips for VME-bus systems.

Design Consultant, [1986 -1987]

**Carroll Touch Division, AMP Inc.**, Round Rock, TX

Developed several new technologies for touch-screen systems. Designed the first ASIC produced for AMP, a mixed-signal interface chip for controlling touch-screen sensors. Developed the system electronics, system firmware, and customer utility software for numerous products including those based on the new ASIC.

Senior Design Engineer, [1983 -1985]

**Touch Technology Inc.**, Annapolis, MD

**Advisory Boards:**

Director, Turtle Beach Corporation (NASDAQ:HEAR) (formerly Parametric Sound Corporation), KBGear Interactive, Inc., Comsilica, Inc., Rioport.com, various S3 subsidiaries.

Technical Advisory Boards, Ageia, Inc., Intellon, Inc., Comsilica, Inc., Entridia, Inc., Siroyan, Ltd., BOPS, Inc, Quester Venture Funds

Carnegie Mellon University Silicon Valley Advisory Board; Johns Hopkins University Tech Transfer Advisory Board

**Awards:**

Micro Test-of-Time Award (in recognition of one of the ten most influential papers of the first 25 years of the symposium), 2014

Business 2.0 “20 Young Executives You Need to Know”, 2002

Walter C. Johnson Prize for Teaching Excellence, 1997.

Princeton University Engineering Council Excellence in Teaching Award, Spring 1996

AT&T/Lucent Foundation Research Award, 1996.

Walter C. Johnson Prize for Teaching Excellence, 1995

IEEE Certificate of Appreciation, 1995, 2001.

AT&T Foundation Research Award, 1993.

Semiconductor Research Corporation Fellow, 1986 - 1991.

Burroughs Corporation Fellowship in Engineering, 1985 - 1986.

**Professional Activities:**

Program Chair: Micro-24, 1991, Hot Chips 13, 2001.

General Chair: Micro-26, 1993, Micro-33, 2000.

Associate Editor: IEEE Computer Architecture Letters; ACM Transactions in Embedded Computing Systems

Speaker at CES, WinHec, Comdex, Intel Dev. Forum, Digital Media Summit, Microprocessor Forum, etc.

Keynote speaker at Micro-34, ICME 2002

IEEE B. Ramakrishna Rau Award committee – 2012-2016

IEEE Computer Society Awards Committee – 2015

CES Awards Judge - 2016

**Over 50 refereed publications.****Publications since January 2006:**

Wolfe, A., “Retrospective on Code Compression and a Fresh Approach to Embedded Systems”, IEEE MICRO, July/Aug. 2016, Invited paper.

**Patents:**

- U.S. Pat. 5,041,701 – *Edge Linearization Device for a Contact Input System*, Aug. 20, 1991.
- U.S. Pat. 5,438,168 – *Touch Panel*, Aug. 1, 1995.
- U.S. Pat. 5,736,688 – *Curvilinear Linearization Device for Touch Systems*, Apr. 7, 1998.
- U.S. Pat. 6,037,930 – *Multimodal touch sensitive peripheral device*, March 14, 2000.
- U.S. Pat. 6,408,421 – *High-speed asynchronous decoder circuit for variable-length coded data*, June 18, 2002.
- U.S. Pat. 6,865,668 – *Variable-length, high-speed, asynchronous decoder circuit*, March 8, 2005
- U.S. Pat. 7,079,133 – *Superscalar 3D Graphics Engine*, July 18, 2006
- EP 1 661 131 B1 – *PORTABLE ENTERTAINMENT APPARATUS*, Jan. 21, 2009
- U.S. Pat. 7,555,006 – *Method and system for adaptive transcoding and transrating in a video network*, June 30, 2009
- U.S. Pat. 7,996,595 – *Interrupt Arbitration for Multiprocessors*, Aug. 9, 2011
- EP 2 241 979 B1 – *Interrupt Arbitration for Multiprocessors*, Oct. 10, 2011
- U.S. Pat. 8,131,970 – *Compiler Based Cache Allocation*, March 6, 2012
- U.S. Pat. 8,180,963 – *Hierarchical read-combining local memories*, May 15, 2012
- U.S. Pat. 8,193,941 – *Snoring Treatment*, June 5, 2012
- U.S. Pat. 8,203,541 – *OLED display and sensor*, June 19, 2012
- U.S. Pat. 8,243,045 – *Touch-sensitive display device and method*, August 14, 2012
- U.S. Pat. 8,244,982 – *Allocating processor cores with cache memory associativity*, August 14, 2012
- U.S. Pat. 8,260,996 – *Interrupt Optimization for Multiprocessors*, Sept. 4, 2012
- 101185761 (KR) – *Noise Cancellation for Phone Conversation*, Sept. 19, 2012
- 101200740 (KR) – *OLED display and sensor*, November 7, 2012
- 101200741 (KR) – *Touch-sensitive display device and method*, November 7, 2012
- U.S. Pat. 8,321,614 – *Dynamic scheduling interrupt controller for multiprocessors*, Nov. 27, 2012
- U.S. Pat. 8,352,679 – *Selectively securing data and/or erasing secure data caches responsive to security compromising conditions*, Jan. 8, 2013
- U.S. Pat. 8,355,541 – *Texture Sensing*, Jan. 15, 2013
- U.S. Pat. 8,370,307 – *Cloud Data Backup Storage Manager*, Feb. 5, 2013
- U.S. Pat. 8,398,451 – *Tactile Input Interaction*, March. 19, 2013
- JP 5241032 B2 – *Routing Across Multicore Network Using Real World or Modeled Data*, April 13, 2013
- ZL201010124820.3 – *Interrupt Optimization for Multiprocessors*, April 17, 2013
- U.S. Pat. 8,428,438 – *Apparatus for Viewing Television with Pause Capability*, April 23, 2013
- JP 5266197 B2 – *Data Centers Task Mapping*, May 10, 2013
- U.S. Pat. 8,508,498 – *Direction and Force Sensing Input Device*, August 13, 2013
- U.S. Pat. 8,547,457 – *Camera Flash Mitigation*, October 1, 2013
- U.S. Pat. 8,549,339 – *Processor core communication in multi-core processor*, October 1, 2013
- 101319048 (KR) – *Camera Flash Mitigation*, October 10, 2013
- U.S. Pat. 8,628,478 – *Microphone for remote health sensing*, January 14, 2014
- 101362017 (KR) – *Thread Shift: Allocating Threads to Cores*, Feb. 5, 2014
- 101361928 (KR) – *Cache Prefill on Thread Migration*, Feb. 5, 2014
- 101361945 (KR) – *Mapping Of Computer Threads onto Heterogeneous Resources*, Feb. 5, 2014
- JP 5487307 B2 – *Mapping Of Computer Threads onto Heterogeneous Resources*, Feb. 28, 2014
- JP 5484580 B2 – *Task Scheduling Based on Financial Impact*, Feb. 28, 2014
- JP 5487306 B2 – *Cache Prefill on Thread Migration*, Feb. 28, 2014
- 101372623 (KR) – *Power Management for Processor*, March. 4, 2014
- 101373925 (KR) – *Allocating Processor Cores with Cache Memory Associativity*, March 6, 2014
- U.S. Pat. 8,676,668 – *Method for the determination of a time, location, and quantity of goods to be made available based on mapped population activity*, March 18, 2014
- U.S. Pat. 8,687,533 – *Energy Reservation in Power Limited Networks*, April 1, 2014
- 101388735 (KR) – *Routing Across Multicore Networks Using Real World or Modeled Data*, April 17, 2014
- U.S. Pat. 8,725,697 – *Cloud Data Backup Storage*, May 13, 2014
- U.S. Pat. 8,726,043 – *Securing Backing Storage Data Passed Through a Network*, May 13, 2014
- ZL201010124826.0 – *Dynamic scheduling interrupt controller for multiprocessors*, May 14, 2014
- JP 5547820 B2 – *Processor core communication in multi-core processor*, May 23, 2014
- U.S. Pat. 8,738,949 – *Power Management for Processor*, May 27, 2014

U.S. Pat. 8,751,854 – *Processor Core Clock Rate Selection*, June 10, 2014  
 JP 5559891 B2 – *Thermal Management in Multi-Core Processor*, June 13, 2014  
 101414033 (KR) – *Dynamic Computation Allocation*, June 25, 2014  
 JP 5571184 B2 – *Dynamic Computation Allocation*, July 4, 2014  
 101426341 (KR) – *Processor core communication in multi-core processor*, May 23, 2014  
 U.S. Pat. 8,799,671 – *Techniques for Detecting Encrypted Data*, Aug 5, 2014  
 101433485 (KR) – *Task Scheduling Based on Financial Impact*, Aug. 18, 2014  
 U.S. Pat. 8,824,666 – *Noise Cancellation for Phone Conversation*, Sept. 2, 2014  
 U.S. Pat. 8,836,516 – *Snoring Treatment*, Sept. 16, 2014  
 U.S. Pat. 8,838,370 – *Traffic flow model to provide traffic flow information*, Sept. 16, 2014  
 U.S. Pat. 8,838,797 – *Dynamic Computation Allocation*, Sept. 16, 2014  
 U.S. Pat. 8,854,379 – *Routing Across Multicore Networks Using Real World or Modeled Data*, Oct. 7, 2014  
 JP 5615361 B2 – *Thread Shift: Allocating Threads to Cores*, Oct. 15, 2014  
 U.S. Pat. 8,866,621 – *Sudden infant death prevention clothing*, Oct. 21, 2014  
 U.S. Pat. 8,881,157 – *Allocating threads to cores based on threads falling behind threads*, Nov. 4, 2014  
 ZL201080024755.5 – *Camera Flash Mitigation*, Nov 5, 2014  
 U.S. Pat. 8,882,677 – *Microphone for remote health sensing*, Nov. 11, 2014  
 U.S. Pat. 8,924,743 – *Securing Data Cache through Encryption*, December 30, 2014  
 U.S. Pat. 8,994,857 – *Camera Flash Mitigation*, March 31, 2015  
 JP 5699140 B2 – *Camera Flash Mitigation*, April 8, 2015  
 ZL201080035189.8 – *Thread Shift: Allocating Threads to Cores*, June 10, 2015  
 ZL201180005030.6 – *Processor core communication in multi-core processor*, June 10, 2015  
 U.S. Pat. 9,143,814 – *Method and system for adaptive transcoding and transrating in a video network*, Sept 22, 2015  
 ZL201080035177.5 – *Mapping Of Computer Threads onto Heterogeneous Resources*, Oct. 14, 2015  
 U.S. Pat. 9,178,694 – *Securing Backing Storage Data Passed Through a Network*, November 3, 2015  
 U.S. Pat. 9,189,282 – *Thread-to-core mapping based on thread deadline, thread demand, and hardware characteristics data collected by a performance counter*, November 17, 2015  
 U.S. Pat. 9,189,448 – *Routing image data across on-chip networks*, November 17, 2015  
 U.S. Pat. 9,208,093 – *Allocation of memory space to individual processor cores*, December 8, 2015  
 U.S. Pat. 9,239,994 – *Data Centers Task Mapping*, January 19, 2016  
 ZL201080036611.1 – *Allocating Processor Cores with Cache Memory Associativity*, January 20, 2016  
 EP2228779 B1 – *Traffic flow model to provide traffic flow information*, Jan. 27, 2016  
 U.S. Pat. 9,262,628 – *Operating System Sandbox*, February 16, 2016  
 GB2485682 – *Mapping Of Computer Threads onto Heterogeneous Resources*, Sept. 28, 2016  
 U.S. Pat. 9,330,137 – *Cloud Data Backup Storage Manager*, May. 3, 2016  
 ZL201080035185.X – *Cache Prefill on Thread Migration*, Aug. 24, 2016  
 U.S. Pat. 9,519,305 – *Processor Core Clock Rate Selection*, December 13, 2016  
 U.S. Pat. 9,569,270 – *Mapping thread phases onto heterogeneous cores based on execution characteristics and cache line eviction count*, February 14, 2017  
 GB2485683 – *Thread Shift: Allocating Threads to Cores*, Oct. 18, 2017  
 U.S. Pat. 9,852,435 – *Telemetrics based location and tracking*, December 26, 2017.  
 U.S. Pat. 9,915,994 – *Power management for processor*, March 13, 2018  
 U.S. Pat. 9,927,254 – *Traffic flow model to provide traffic flow information*, March 27, 2018  
 EP2254048 B1 – *Thread Mapping in Multi-Core Processors*, August 29, 2018

**Testimony by deposition or at trial – February 15, 2015 - -present**

<b>Case</b>	<b>Venue</b>	<b>Case Number</b>
Kangaroo Media, Inc. et al. v. YinzCam, Inc.	District of Western Pennsylvania	2:12-cv-00382-JFC
Inter Partes Review of: U.S. Patent No. 8,176,267 (CATR v Kingston)	PTO	IPR2015-00149
Inter Partes Review of: U.S. Patent No. 6,890,188 (Imation v Kingston)	PTO	IPR2015-00066
INTELLECTUAL VENTURES II LLC v JP MORGAN CHASE & CO., et al.,	Southern District of NY	13 Civ. 3777
Samsung Electronics Co., Ltd. and Samsung Electronics America Inc. vs. NVIDIA Corporation, Old Micro, Inc. f/k/a Velocity Micro, Inc., and Velocity Holdings, LLC	E. D. Virginia	3:14-cv-00757-REP
Certain Touchscreen Controllers and Products Containing Same (Synaptics v Shenzhen Huiding Technology Co., Ltd)	ITC	337-TA-957
Inter Partes Review of: U.S. Patent No. 7,742,053 (LG v ATI) (also 6,897,871 and 7,327,369)	PTO	IPR2015-00325 IPR2015-00326 IPR2015-00330
Ericsson Inc., et al. v TCL Communication Technology Holdings, LTD, et al.	E. D. Texas	2:15-cv-11
Certain Table Saws Incorporating Active Injury Mitigation Technology and Components Thereof (Sawstop v Bosch)	ITC	337-TA-965
INTER PARTES REVIEW OF U.S. PATENT NO. RE43,931 (TCL v Ericsson)	PTO	IPR2015-01602 IPR2015-01637 IPR2015-01641 IPR2015-01646 IPR2015-01674 IPR2015-01676 IPR2015-01761 IPR2015-01806
T-Mobile, USA, Inc. v. Huawei Device USA, Inc. and Huawei Technologies Co., Ltd.	W. D. Washington	14-cv-1351
AVM Technologies, LLC v. Intel Corporation and Related Matters	District of Delaware	15-33-RGA
TCL v. Ericsson, et al.	C.D. California	8:14-cv-341
Sonos Inc. v D&M Holdings Inc. d/b/a the D&M Group; D&M Holdings U.S. Inc. and Denon Electronics (USA) LLC.	District of Delaware	14-1330-RGA
Waymo v Uber et. al	N. D. CA	3:17-cv-00939
Certain Graphics Systems, Components Thereof and Consumer Products Containing the Same	ITC	337-TA-1044
Intellisoft, Ltd. v Acer	Superior Court of California for the County of Santa Clara	1-14-CV-272381
INTER PARTES REVIEW OF U.S. PATENT NO. 7,987,294 (D&M Holdings v Sonos)	PTO	IPR2017-01045
Joe Andrew Salazar v HTC Corporation	E.D. Texas	2:16-cv-010986-JRG-RSP
Hitachi Maxell, Ltd. v. ZTE Corporation and ZTE (USA), Inc.	E.D. Texas	5:16-cv-00179 5:16-cv-00178
D&M Holdings Inc. d/b/a the D&M Group; D&M Holdings U.S. Inc. v. Sonos Inc.	District of Delaware	16-00141-RGA

INTER PARTES REVIEW OF U.S. PATENT NO. 7,663,506 (Mediatek v AMD)	PTAB	IPR2017-00101 IPR2017-00102
Papst Licensing GmbH & Co. KG v. Samsung Electronics Co.,Ltd. and Samsung Electronics America, Inc.	E.D. Texas	6:15-CV-1102
HTC Corporation v. Telefonaktiebolaget LM Ericsson	E.D. Texas	6: 18-cv-00243-JRG
Seven Networks, LLC v ZTE (USA) Inc and ZTE Corporation	N. D. Texas - Dallas	3:17-CV-1495
AGIS Software Development, LLC v. HTC Corporation	E. D. Texas	2:17-cv-514
Barbaro Technologies, LLC v. Niantic, Inc	N.D. CA	3:18-cv-02955-RS
Immersion Corp. v. Samsung Electronics America, Inc. et al	E.D. Texas	2:17-cv-00572
INTER PARTES REVIEW OF U.S. PATENT NO. 7,171,526 (Northstar Innovations – Micron)	PTAB	IPR2018-01004 IPR2018-01005
CISCO SYSTEMS, INC., vs. UNILOC USA, INC., UNILOC 2017 LLC and UNILOC LICENSING USA LLC	N.D. CA	3:18-cv-04991-SI
INTER PARTES REVIEW OF U.S. PATENT NO. 8,020,014 (Intel/VLSI)	PTAB	IPR2018-01661 IPR2018-01312
INTER PARTES REVIEW OF U.S. PATENT NO Patent 9,294,799 (Comcast/Rovi)	PTAB	IPR2019-00299